

# Directed flow of identified particles in Au+Au collisions at $\sqrt{s_{\text{NN}}} = 14.6$ and $19.6$ GeV

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1 Determination of equation of state for the nuclear matter at high baryon  
2 density region is one of the most important motivations for RHIC Beam Energy  
3 Scan program. Directed flow ( $v_1$ ), which is the first harmonic coefficient in the  
4 Fourier expansion of the final state azimuthal distribution of produced particles  
5 relative to the collision reaction plane, is one of the sensitive probes for the early  
6 stages of collision dynamics.

7 The first phase of RHIC Beam Energy Scan (BES-I) program covers colli-  
8 sion energies from  $\sqrt{s_{\text{NN}}} = 7.7$  GeV to 200 GeV. We observed that  $v_1$  slopes  
9 ( $dv_1/dy|_{y=0}$ ) at mid-rapidity region for net-proton and net- $\Lambda$  show a minimum  
10 when collision energy is around  $\sqrt{s_{\text{NN}}} = 10$ -20 GeV [1]. The slope of  $\phi$ -meson  
11  $v_1$  has a hint of sign change between 11.5 and 14.5 GeV [2]. In this talk, we will  
12 present precision measurements of  $v_1$  for pions, kaons, protons, and  $\phi$ -mesons  
13 using high statistics RHIC BES-II data for Au+Au collisions at 14.6 and 19.6  
14 GeV. The corresponding  $v_1$  slopes will be studied as a function of transverse  
15 momentum, rapidity, and collision centrality. The data will constrain the model  
16 calculations and provide important insights on the possible first order QCD  
17 phase transition.

## 18 References

- 19 [1] L. Adamczyk et al.(STAR Collaboration), Phys. Rev. Lett. 112, 162301  
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